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ABSTRACT

A model is presented for the effects of compulsory high school attendance and the relationship between the percent completing high school and the benefits associated with high school completion. Some of the characteristics of this nation's educational system are discussed, and a normative principle is stated that those having a greater share of educational goods merit a greater share of non-educational social goods. The model assumes two categories of people: high school graduates with no further education and those who have not graduated. It further assumes a normal distribution of non-educational social benefits and a perfect biserial correlation between high school graduation and social benefits. The conclusion is reached that beyond a 75 percent high school completion ratio, it no longer pays to finish high school, but it is a serious social disaster not to do so. It is suggested that the present rate of 75 percent may be a natural point of stability. The possible effects of various educational policies are discussed in terms of the implications of this model. (Author/CTM)

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TOWARD A GENERAL MODEL OF THE SHIFTING BENEFITS AND LIABILITIES OF EDUCATIONAL ATTAINMENT

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Toward a General Model of The Shifting Benefits and Liabilities of Educational Attainment

ROBERT H. SEIDMAN

ABSTRACT

An analytic logico-mathematical model shows how socioeconomic benefits to high school attainers decline and how the liabilities to non-attainers increase as the percentage of 17-18 year olds graduating from high school increases toward 100%. The model offers explanatory evidence for the stabilization of the national high school graduation ratio at 75% since 1965, why educational policies aimed at increasing this ratio are likely to be counter-productive, and why this ratio is unlikely to change in the near future. The model is based upon a distributive theory of educational systems and is one of a class of general models.

TOWARD A GENERAL MODEL OF THE SHIFTING BENEFITS AND LIABILITIES OF EDUCATIONAL ATTAINMENT[1]

by Robert H. Seidman

This paper seeks to show how the size of the educational system affects the social benefits and liabilities of educational attainment. In Part I, I utilize certain principles of the logic and behavior of the educational system (qua system) to build a theoretical basis for the logico-mathematical model developed in Part II. In Part III, I discuss the results of the model, some implications for educational policy, and suggest an agenda for future research, including the creation of a general model of the shifting benefits and liabilities of educational attainment.

I

THE EDUCATIONAL SYSTEM

It is possible, and quite likely, to leave school in the middle of the eighth grade in Winfield, Oregon, and to enter the same grade in Beaumont, Texas, and find nearly identical curricula, procedures, and facilities. It is clear that some kind of system exists. I distinguish between a system of <u>education</u>, which encompasses all of the many ways a society educates and socializes its youth, and an <u>educational system</u>, which satisfies the primary and secondary properties described below. Educational systems are usually found in societies which establish specialized institutions to carry out educative and social functions.[2]

The educational system's primary features are threefold, <u>First</u>, the system is composed of schools and colleges, but not all schools and colleges. <u>Second</u>, these schools and colleges are related by a "medium of exchange" which includes those certificates, degrees, diplomas, letters of

recommendation and the like, which allow persons to leave any level of the system in one locality and enter the same level in another. They are all instruments by which activities carried out in one place can be recognized and "exchanged" for similar activities of a school or college in some other place (a kind of common coinage). Third, by "educational system," I mean those schools and colleges that are connected by a medium of exchange and that are arranged by the Principle of Sequence. This principle states that these schools and colleges are organized into levels so that if a person has attained (i.e., completes) level N, then he or she has attained level N-1, but not necessarily level N+1. This principle allows us to speak of persons progressing through the system and appears to be a necessary property of any educational system due, in part, to differing levels of skill accomplishment, knowledge acquisition, and cognitive development of individuals. Completing a level of the educational system is what I mean by educational attainment at that level.

In addition to these primary elements, the educational system has three secondary or derivative properties. The system will have a definite size, a system of control, and will create a distribution of educational goods and second-order educational goods. Since the perspective for the following analysis is a distributive one, which includes the notion of systemic size, I shall not consider the system of control.

Every society makes some arrangement for the distribution of its goods (benefits). The educational system distributes educational goods such as knowledge, skills, and certain kinds of taste. In addition to these goods, the educational system distributes their surrogates, called second-order goods, such as grades, diplomas, and certificates. Some

persons, because of their greater ability (however it is defined within the system), tenacity, and acuity of choice, will come to possess a larger share of educational goods than other persons. If it is the case that non-educational social goods such as income, earning opportunities, and status are distributed by the socioeconomic system on the basis of the distribution of educational goods (through the instrumentality of second-order educational goods), then there exists a normative principle that links the educational and socioeconomic systems.

This normative principle states that "those having a greater share of educational goods merit or deserve a greater share of non-educational social goods." The power or strength of this normative principle can be viewed as a function of the size of the educational system. For the purpose of this analysis, size is taken to be the attainment ratio (one of eight modes of systemic growth) at the twelfth level of the system: the percentage of 17-year-olds obtaining the high school degree. The systemic principles described below hold, however, for any level of the educational system.

When the system is small (e.g., 10% attainment ratio), the socioeconomic rewards of attainment are likely to be quite negligible. The high school diploma is not likely to be used as a screening prerequisite for job entry, for example. In the aggregate, high school attainers do not monopolize economic opportunities simply because of attainment. Thus, the strength of the normative principle is low. In addition, to be a high school dropout when 90% of your age-cohort drops out presents no serious personal or social problem.

As the size of the educational system increases, the strength of the normative principle also increases, in part, because employers begin to

utilize high school attainment as a selection criterion. There are, however, systemic constraints on the strength of the principle. When all 17-year-olds attain the high school diploma (100% attainment ratio), then its mere possession cannot guarantee any socioeconomic advantage. This is due to the tautological Law of Zero Correlation, which is necessarily true at any level of the educational system where the attainment ratio is 100% (or 0%). The law states that: "There is a point in the growth of the system at which there is no longer any correlation between educational attainment and either the distribution of educationally relevant attributes in the population or the distribution of non-educational social goods ordinarily associated with educational attainment."

It is important to note that this law makes a logical claim, not an empirical one. In order for there to be a correlation between any two variables, both must be distributed in the population under consideration. If one of these variables is uniformly distributed, no correlation can occur. For instance, a society could not distribute any of its goods <u>based upon</u> eye color if everyone had brown eyes. Thus, an empirical claim is not only unnecessary, but inappropriate. It is equally important to note that the law makes a claim about educational attainment and not about educational achievement, which is another matter altogether.

One corollary of the Law of Zero Correlation, the Law of Shifting Benefits and Liabilities, assures that high school attainment will have a <u>declining</u> social value and that, concomitantly, failure to attain the high school diploma will have an <u>increasing</u> social liability, as the high school attainment ratio moves toward the zero correlation point. Thus, as zero correlation is approached (at 100% attainment), the social benefits

associated with high school attainment decline, and the social liabilities of non-attainment increase. These notions are illustrated in Fig. 1.

In Fig. 1, the horizontal axis represents 100 years of time. The solid line, "High School Attainment Ratio," represents the assumption that the educational system grows at a uniform rate of 10% per decade. The dotted curve, "Social Benefits of Attainment," represents the strength of second-order educational goods in securing non-educational social goods. At points A and B, this strength must be zero, due to the Law of Zero Correlation. These two points are conceptually derived, although the actual shape of the benefit curve is a contigent matter. As the attainment ratio increases from zero to 100%, the benefit curve rises until it peaks and then declines to zero. This illustrates how the power of the normative principle increases and then decreases, although the personal and social belief in it (i.e., the efficacy of educational attainment) may remain steady.

The other side of the benefit/liability coin is the social liability associated with systemic growth. The dashed curve in Fig. 1, "Social Liabilities of Attainment," represents the conjecture that at the lower attainment ratios, not having a diploma is not a serious problem. However, as more and more of the age cohort attain the twelfth level, non-attainment becomes an increasing liability. Even though the benefits once associated with the high school diploma begin to decline, the liabilities of not having it increase. The precise shape of this liability curve is a contingent matter, that it rises is the point I wish to make.

Figure 1 exposes a peculiar paradox. As zero correlation is approached, the social benefits once associated with high school attainment decline and the social liabilities of non-attainment increase. Where high school

attainment was once a highly sought after good, it now becomes a necessity to be endured. Where school leaving was once a possible and viable consideration, it now becomes an evil to be avoided at all costs. These shifting benefits and liabilities make high school attendance and attainment increasingly compulsory in ways that were surely never meant to be.[3] The personal and social consequences of such a situation can be devastating.

II

AN AGGREGATE MODEL OF THE SHIFTING BENEFITS AND LIABILITIES OF EDUCATIONAL ATTAINMENT

It is of some interest to illustrate the systemic principles of Part I with a logico-mathematical model. This model can help to determine whether inflection points exist in the two curves of Fig. 1 and, if they do, just where they are located. The model will also help us get at the meaning of the "intersection" of these two curves. Although it is possible to determine the shapes of these two curves using empirical data, I use logico-mathematical data (data which are derived deductively from the properties of a particular mathematical distribution) to extend the conceptual analysis of Part I.

My approach to the model is illustrated in Fig. 2. Suppose that we divide the population under consideration (e.g., all 18- to 24-year-old males) into those who have attained the high school degree (but who have not gone beyond level 12) and those who have not attained the degree. The normative principle suggests that attainers monopolize the upper portion of this distribution, but not, I suspect, when the system size is smaller than 35% high school attainment. As the attainment ratio increases, line X-X moves down, and the median value of the social benefits for the

attainer group declines. Similarly, the median value of the social benefits for the non-attainer group declines, which is to say that the liabilities associated with non-attainment increase.

A conventional analysis of this situation is to consider whatever is gained by attainers to be the magnitude of the liability experienced by the non-attainers. If, for example, in Fig. 2, the median income of the attainer group is 150% of the median income of the non-attainer group (at 40% attainment ratio), then the benefit to the former group is 50%, and the liability to the latter group (in foregone income and earnings opportunities, etc.) is 50%. This kind of analysis, however, tends to obscure a full view of the shifting benefits and liabilities of educational attainment.

There is another way to view this matter, one which better illustrates the phenomena discussed in Part I. If we first find the difference between the median benefit of the attainer group and the median benefit of the entire population under consideration, and do the same for the non-attainer group, then the difference between these two grand median dispersions is a measure of the relative position of one group with respect to the other.

This approach can now be rendered into a logico-mathematical model. The aggregate model rests upon three idealized assumptions:

1. Non-educational social benefits are always normally distributed in the population under consideration and a change in the high school attainment ratio does not affect the normal shape of this distribution.
2. Within this normal distribution, we can identify high school attainers and non-attainers.

3. Society allocates its social benefits in such a way that those who attain the high school diploma monopolize the upper end of the normal distribution.

The first assumption, which fixes the overall shape of the distribution, offers a particular view of distributed justice. It could be said that this type of distribution reflects some normally distributed attribute or attributes in the population under consideration. For instance, it is thought, in some quarters, that IQ is normally distributed in the general population. Assumptions two and three tell us that we can identify the attainers and that they can be found, as a group, lumped at the upper end of the distribution. The third assumption represents an overly rigid meritocratic society. However, it will suffice for now to illustrate the points made by the aggregate model.

These assumptions are realized in Fig. 3, which is a normal distribution in standardized form having a grand mean (μ_ρ) of zero and a standard deviation (σ) of one. Each asymptote is truncated, for computational purposes, at 3.9σ from the mean, resulting in a loss of 0.26% of the total population under the curve. The high school attainment ratio (ϕ) is represented by the shaded area under the curve. This is the proportion of the total population under consideration that has attained the high school diploma. The median value of the social benefits of this group is μ_ϕ. The unshaded portion under the curve is the proportion of the total population that has not attained the high school degree ($\bar{\phi}$) and is equal to $1-\phi$. The median value of the social benefit for this group is $\mu_{\bar{\phi}}$.

Note that μ_ϕ and $\mu_{\bar{\phi}}$ change as ϕ changes. When $\phi = 0$, $\mu_{\bar{\phi}} = \mu_\rho$. When ϕ approaches its limit of 1, μ_ϕ approaches μ_ρ, and $\mu_{\bar{\phi}}$ approaches -3.9σ.

We can calculate the values of μ_ϕ and $\mu_{\bar{\phi}}$ for the values of ϕ (μ_ϕ and $\mu_{\bar{\phi}}$ are always measured with respect to the grand median, μ_ρ). A sample calculation for $\phi = .30$ (30% attainment) is shown in Appendix A and illustrates the calculation procedure.

Table 1 shows the values of μ_ϕ and $\mu_{\bar{\phi}}$, their differences and their rates of change with respect to themselves, for values of ϕ ranging from .01 to .99. Figure 4 is a plot of μ_ϕ and $\mu_{\bar{\phi}}$ by ϕ. Figure 5 is a plot of the rate of change of μ_ϕ by ϕ, and Fig. 6 is a plot of the rate of change of $\mu_{\bar{\phi}}$ by ϕ.

Model Analysis

If we think of such social benefits as income, salary and wages, then a conventional supply and demand analysis tells us that as the supply of high school graduates increases, the relative social benefits realized by these graduates, with respect to those with no high school degree, will decline (given a constant market demand for attainers). This is just what happens in the aggregate model as ϕ goes from .01 to .50 (see Column 4 in Table 1). However, in the model, as the attainment ratio exceeds 50%, the relative advantage of the attainers over the non-attainers increases. See Fig. 4.

These latter results of the model are consistent with certain empirical findings. Time-series U.S. Census data for 18- to 24-year-old males from 1939 (when the high school attainment ratio was 50%) to 1975, display this very phenomenon.[4] And a U.S. Senate report (The Mondale Committee Report) examining the incomes of 24- to 34-year-old males expressed surprise at the "paradox" of increasing relative income for high school attainers over non-attainers.[5] It appears that the aggregate model adequately illustrates aspects of the Law of Shifting Benefits and

Liabilities and its logico-mathematical results seems to be somewhat consistent with certain empirical data.[6]

For educational policy purposes, it is of considerable interest to detect any inflection points in the curves shown in Fig. 4. These points might indicate sensitive aspects of systemic growth that are candidates for influence by educational policies.

Figure 5 is a plot of the rate of decline of the social benefits of attainment generated by the model. Note that after $\phi = .20$, the median value declines at a fairly constant rate until the high school attainment ratio reaches 50%. At this point, in the growth of the educational system, the rate of decline increases and begins a very steep ascent at 75% attainment.

Figure 6 is a plot of the rate of decline of the non-attainer group median value of social benefits. Here the median declines at a decreasing rate until 75% attainment when the rate begins to increase and then increases sharply at 80% attainment.

Thus, the two curves in Fig. 4 can be said to contain inflection points which occur at the point in systemic growth where the high school attainment ratio is 75%. That these inflection points both occur at 75% attainment suggests an answer to the question: What is the meaning of the "intersection" of the benefit and liability curves in Fig. 1? The two curves do not actually intersect--they have different vertical axes--but the intersection shown in Fig. 1 illustrates their <u>interactive</u> effects quite nicely. We can view this "intersection" as an equilibrium point in the <u>growth</u> of the system beyond which it no longer pays (in aggregate social benefit terms) to finish high school but is quite a serious social disaster not to do so. This paradox or double bind makes it difficult to

see just how the attainment ratio can move much beyond 75%. It is interesting to note that the U.S. high school attainment ratio has remained constant at about 75% since 1965.[7]

III

TOWARD A GENERAL MODEL AND THREE POLICY CONSIDERATIONS

The Model

The results of the aggregate model developed in Part II reflect the systemic principles discussed in Part I and seem to coincide with certain empirical findings. Although the model (and principles) is generalizable to any systemic level, to any second-order educational good and to any non-educational social good, it does have its limitations.

It is unreasonable to apply the model at the lower attainment ratios since it is thought that high school attainers do not realize social benefit advantages over non-attainers when the system size is small. While I have no solid grounds to judge, my hunch is that the model reflects the situation after 35% attainment. The precision of this number will have to be determined on empirical grounds.

The assumption that social benefits are normally distributed over changing attainment rates reflects a particular ideal of distributive justice. There are other distributions reflecting other notions of justice that could be candidates for analysis.

The third assumption reflects an extremely meritocratic society. This condition can be relaxed, and a measure of the extent to which a society is meritocratic (a meritocratic parameter) can become a variable in the analysis.

The aggregate model can be thought to be one of a class of ideal models, each reflecting a particular notion of justice which could include

varying values of the meritocratic parameter. These models could be used as benchmarks against which to compare (in a quantitative way) empirical departures from ideals. For example, despite the above model limitation, how is it that some of the model's results appear to coincide with certain empirical data?

The aggregate model represents a first step, albeit a crude one, toward a general logico-mathematical theory of the shifting benefits and liabilities of educational attainment.

Policy Consideration

American educational policy has, for the most part, been preoccupied with the benefit side of the benefit/liability coin. An extremely unjust and punitive situation has arisen for those who, for one reason or another, do not complete high school. A policy with the goal of increasing the high school attainment ratio might have been a reasonable one when the system was small, but is a dysfunctional one now that the system is large. This raises the intriguing question of whether there might be an optimal size for the system.

According to the systemic principles considered here, attempts to reduce educational inequality by increasing the high school attainment ratio from its present level of 75% will fail to reduce socioeconomic inequality. The very opposite of the intended results will occur. One possible way around this obstacle is to push the attainment ratio to 100%, where zero correlation at the high school level sets in. Thus, it can be argued, educational equality will be achieved, and the high school diploma will no longer be the basis for the distribution of non-educational social goods.

Leaving aside the meaning of "educational equality," this approach has two significant pitfalls. First, the system had better reach 100% high school attainment very rapidly in order to minimize the hardship that will have to be endured by the decreasing percentage of non-attainers. It is difficult to see how just such a manuever can be accomplished without substantial suffering. In addition, ever since the "dropout problem" became a problem in the late 1950s (when the high school attainment ratio was higher than it had ever been previously), great effort has been expended to advance the ratio. These efforts have met with very little success.

Second, even if 100% high school attainment could be achieved, the original inequality problems would remain unsolved--they would merely be shifted to a higher level of the educational system. If the normative principle persists, then the distributional instrument will shift to the postsecondary level of the system, the next higher level according to the Principle of Sequence. It can be argued that this phenomenon, despite the current 75% high school attainment ratio, is already beginning to manifest itself at the college level.

Since the postsecondary level of the system is, for the most part, selective (one does not only choose to go on beyond high school; one is chosen), enormous pressures to alter this selectivity principle will appear. Some of the results of these already occurring pressures are manifested today in the rise of non-selective junior colleges. They operate, it can be argued, as a kind of "safety valve" for the selective part of the system.

Another possible policy alternative is to reduce the high school attainment ratio to 55-60%. This is the point, in the growth of the

educational system where the decline in the social benefits of attainment and the precipitous rise in the social liabilities of non-attainment are thought to begin. In thinking about such a policy, careful consideration should be given for the provision of ample opportunities for all to continue their education (i.e., pursue learning). Such a policy must avoid an inequitable distribution of the non-attainers on the basis of class, race, and ethnic background.

This kind of a policy, along with its accompanying constraints, might not gain much political support and would, I suspect, prove difficult to implement. Nevertheless, such a policy is already being carried out to a certain extent by the present movement towards competency-based curricula. If competency achievement (not attainment) levels are enforced, a sizable proportion of those who now normally complete high school may never do so. And a large percentage of this group will likely be composed of persons from lower socioeconomic groups. This state of affairs seems hardly an adequate solution to the problem of inequality of socioeconomic opportunities.

So far, I have been considering policies which assume the continued presence of the normative principle. The abandonment of this principle might be the most efficacious, but politically and socially the most difficult, way to reduce educational and socioeconomic inequality. Americans seem to have an almost religious faith in the efficacy of educational attainment. If educational attainment is no longer an instrument for the distribution of non-educational social goods, then perhaps education could once again be pursued for the benefits that are intrinsic in the educational goods themselves and not for the socioeconomic advantages that disappear with ever increasing rates and levels of attainment.

Such a move would mean the abandonment of the illusion that the educational system is a solution to almost every social ill. It is not clear to me just what new instruments for the distribution of social benefits would spring up or how one would judge their desirability as a replacement for educational attainment.

The three policy alternatives considered above are certainly not exhaustive and deserve a more detailed and thorough consideration than I have been able to provide in this brief paper. Each, I believe, has wide-ranging political and social consequences, and each offers great challenges for policy analysis. In addition, these policy alternatives provide a context within which to examine fundamental societal goals and to confront the vital issue of social justice.

A general model of the shifting benefits and liabilities of educational attainment--one in which assumptions, principles, and parameters may be altered--might be of great value in the exploration of these alternatives and other educational policies.

APPENDIX A

SAMPLE CALCULATION OF THE MEDIAN VALUE OF THE SOCIAL BENEFITS FOR HIGH SCHOOL ATTAINERS AND NON-ATTAINERS

Suppose that the attainment ratio stands at 30% (see Fig. A-1). We know that the attainer group monopolizes the social benefits ranging in value from 0.525σ to 3.9σ.[8] The median benefit for this group is thus $\mu_{\phi} = 1.037\sigma$. This is the point under the ϕ portion of the total curve where one half of the high school attainers (i.e., 15%) lies to the right and where the other half lies to the left.

The median social benefits for the remaining 70% of the total population (i.e., the non-attainer group) is $\mu_{\bar{\phi}} = -0.385\sigma$. This is the point under the $\bar{\phi}$ portion of the total curve where one half of the high school non-attainers (i.e., 35%) lies to the right and where the other half lies to the left.

These median social benefit values are derived from the standardized normal distribution, which represents a particular normal distribution of social benefits. If it turns out that, for this particular normal distribution, the median of the total distribution is \$8,000 with a standard deviation of \$2,500, we can easily calculate the medians (in dollars) of the attainer and non-attainer groups.

Attainer Group Median: \$10,593 = \$8,000 + (1.037 x \$2,500)

Non-Attainer Group Median: \$ 7,038 = \$8,000 + (-0.385 x \$2,500).

TABLE 1

MEDIAN SOCIAL BENEFITS, THEIR DIFFERENCES, AND THEIR RATES OF CHANGE FOR ATTAINER AND NON-ATTAINER GROUPS BY HIGH SCHOOL ATTAINMENT RATIO

(1) Size of Attainment Group (ϕ)	(2) Attainer Group Median (μ_{ϕ})	(3) Non-Attainer Group Median ($\mu_{\bar{\phi}}$)	(4) $\mu_{\phi} - \mu_{\bar{\phi}}$	(5) Rate of Change of μ_{ϕ}	(6) Rate of Change of $\mu_{\bar{\phi}}$
0.01	2.575	-0.012	2.587		
0.05	1.960	-0.063	2.023	0.2388	4.2500
0.10	1.645	-0.126	1.771	0.1607	1.0000
0.15	1.440	-0.189	1.629	0.1246	0.5000
0.20	1.283	-0.253	1.536	0.1090	0.3386
0.25	1.150	-0.319	1.469	0.1037	0.2609
0.30	1.037	-0.385	1.422	0.0983	0.2069
0.35	0.935	-0.454	1.389	0.0984	0.1792
0.40	0.842	-0.524	1.366	0.0995	0.1542
0.45	0.755	-0.598	1.353	0.1033	0.1412
0.50	0.675	-0.675	1.350	0.1060	0.1288
0.55	0.598	-0.755	1.353	0.1141	0.1185
0.60	0.524	-0.842	1.366	0.1237	0.1152
0.65	0.454	-0.935	1.389	0.1336	0.1105
0.70	0.385	-1.037	1.422	0.1520	0.1091
0.75	0.319	-1.150	1.469	0.1714	0.1090
0.80	0.253	-1.283	1.536	0.2069	0.1157
0.85	0.189	-1.440	1.629	0.2530	0.1224
0.90	0.126	-1.645	1.771	0.3333	0.1424
0.95	0.063	-1.960	2.023	0.5000	0.1915
0.99	0.012	-2.575	2.587	0.8095	0.3138

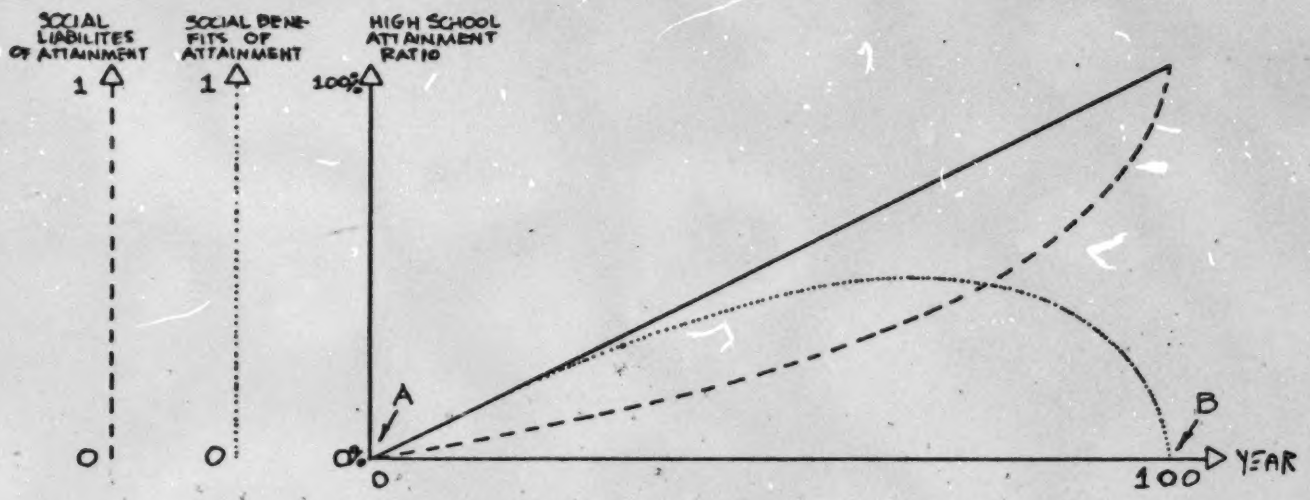

Figure 1. Social Benefit and Liability Curves and a Hypothetical Uniform Growth Line of the High School Attainment Ratio (adapted from Green, with Ericson and Seidman, op, cit., Figures 6.1, 6.2, and 6.3).

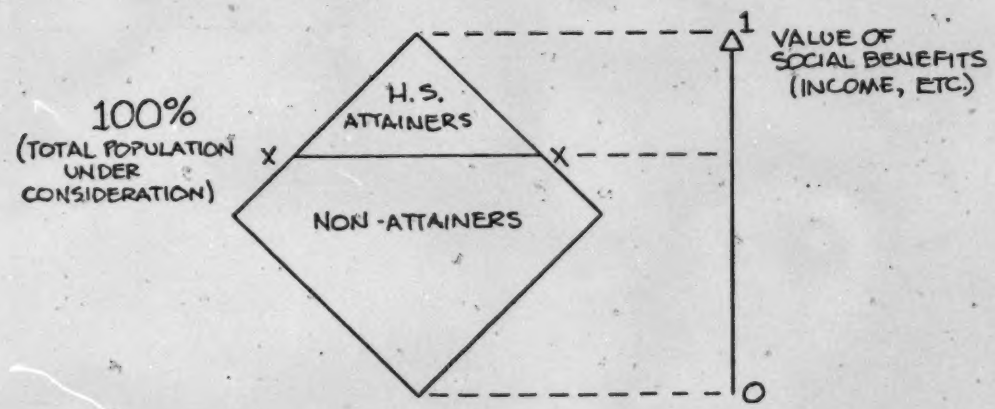

Figure 2. Distribution of Social Benefits for High School Attainers and Non-Attainers: The Aggregate Model Approach

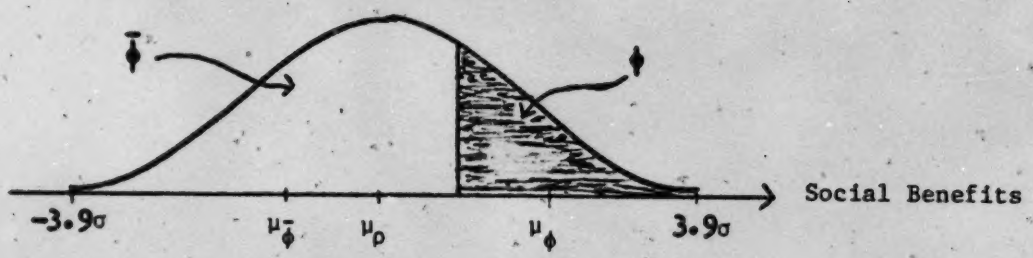

Figure 3. Standardized Normal Curve for the Distribution of Social Benefits (ϕ = high school attainment ratio; $\bar{\phi}$ = non-attainment ratio; $\mu_\rho = 0$ = grand median μ_ϕ = median social benefit for attainer group; $\mu_{\bar{\phi}}$ = median social benefit for non-attainer group; $\sigma = 1$ = standard deviation).

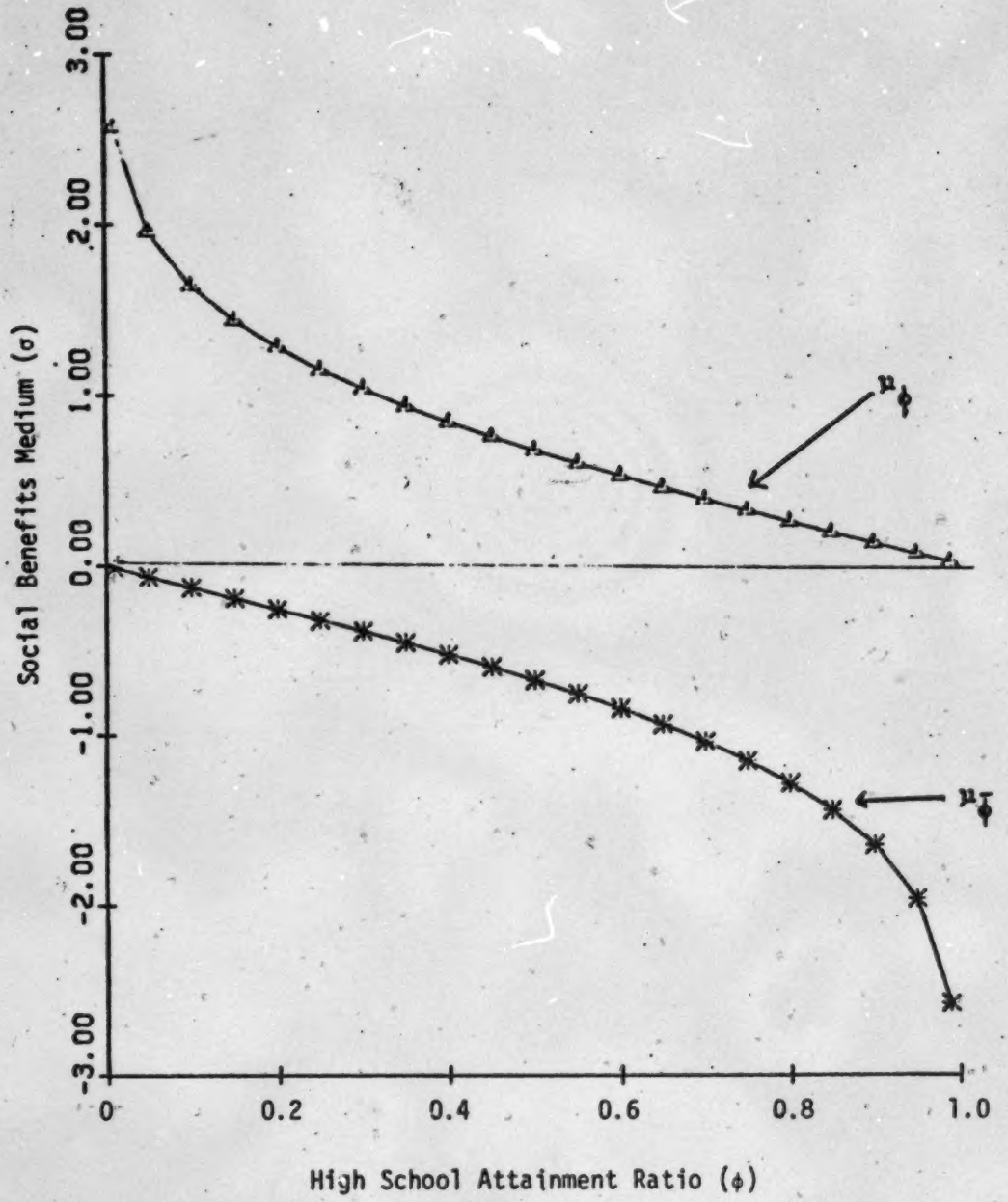

Figure 4. Median Social Benefit of Attainer Group ($\mu_{+\phi}$) and Non-Attainer Group ($\mu_{-\phi}$) by High School Attainment Ratio (ϕ) (from Table 1, Columns 2 and 3).

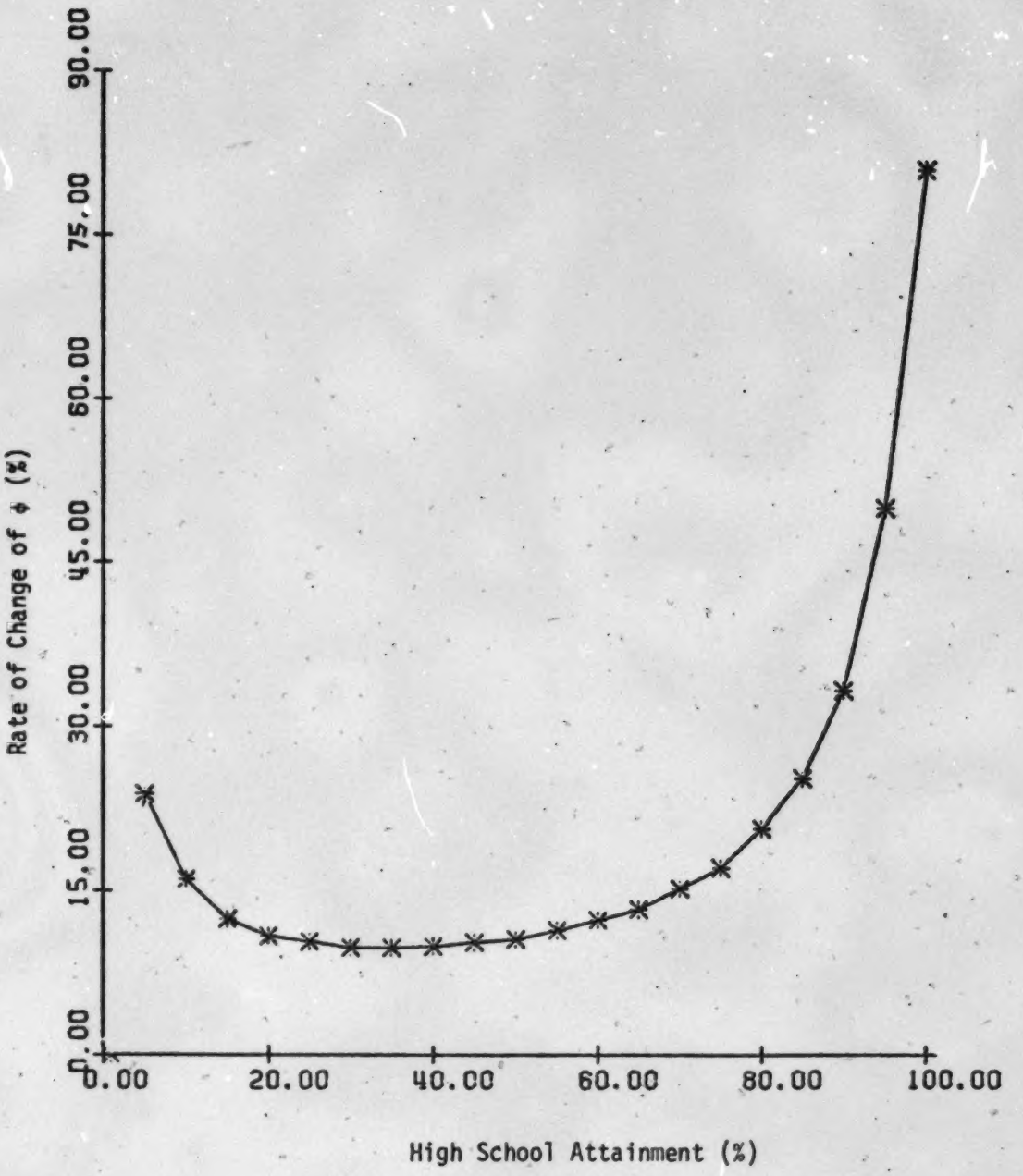

Figure 5. Rate of Change of Attainer Group Median by High School Attainment Ratio (from Table 1, Column 5).

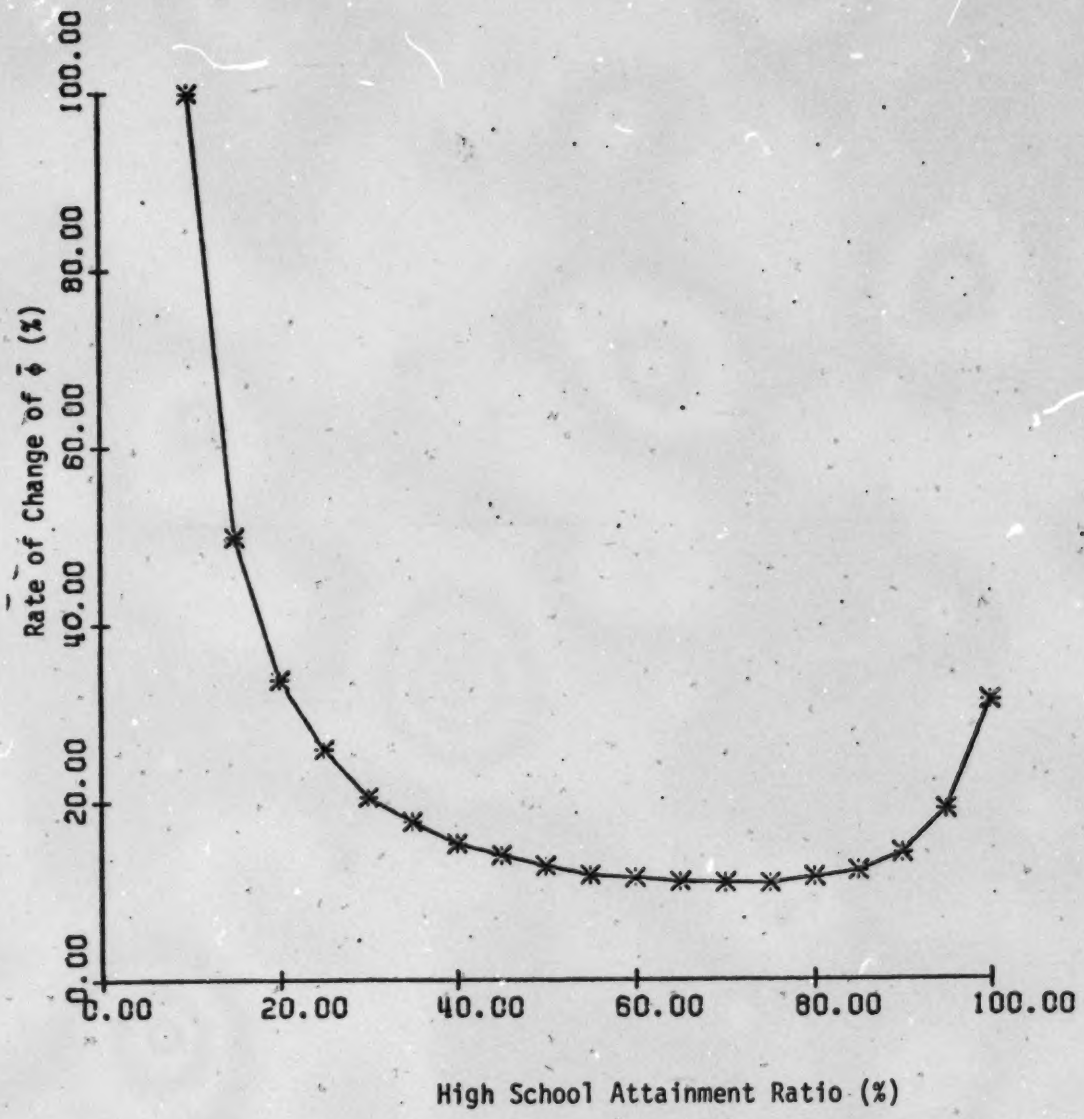

Figure 6. Rate of Change of Non-Attainer Group Median by High School Attainment Ratio (from Table 1, Column 6).

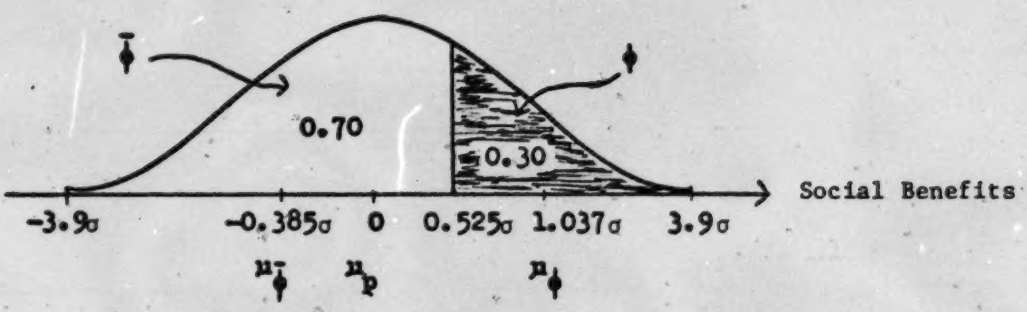

Figure A-1. Sample Standardized Normal Curve for the Distribution of Social Benefits Where the High School Attainment Ratio is 30%.

FOOTNOTES

1. Many of the ideas presented in Parts I and III of this paper are given a much more detailed and complete description in Thomas F. Green, with assistance of David P. Ericson and Robert H. Seidman: *Predicting the Behavior of the Educational System,* Syracuse University Press, New York, forthcoming June 1980.

   I have borrowed freely from this work and, therefore, make no reference to specific parts of it in the text of this paper. The quote on page 4 can be found in Chapter 6. I am grateful to have had the opportunity to collaborate with Green and Ericson. They are, of course, not responsible for any shortcomings of this paper.

2. Thomas F. Green argues that educational systems first began to emerge in the early years of this centry. See "Images of Education in *Kyklios Paideia,*" *Proceedings of the National Academy of Education,* vol. 3, 1976, pp. 109-149. The American example might just be a system that has reached or is reaching maturity.

3. Schooling is compulsory because it is universal, not universal because it is compulsory. It is variable attainment ratios and not compulsory attendance statutes that compels school going. See David P. Ericson and Robert H. Seidman: "Compulsory Schooling Without Compulsory Attendance Laws: Reflections on the Behavior of Educational Systems," *Proceedings of the Philosophy of Education Society,* 1978, pp. 316-324.

   This is a view that is in sharp contrast to the revisionist version (Samuel Bowles and Herbert Gintis: *Schooling in Capitalistic America,* Basic Books, New York, 1976) and to the historical explanation offered by David Tyack ("Ways of Seeing: An Essay on the History of Compulsory Schooling," *Harvard Educational Review,* 46, August 1976).

4. U.S. Bureau of the Census: *Decennial Census Reports* for 1940, 1950, 1960, 1970; *Current Population Reports,* P-60, nos. 85, 90, 92, 97, 101.

5. Henry M. Levin, et al.: *The Costs to the Nation of Inadequate Education. A Report Prepared for the Select Committee on Equal Educational Opportunity of the U.S. Senate,* U.S. Government Printing Office, Washington, D. C., January 1972.

6. The systemic principles and the results of the model provide a contrasting systemic explanation to Lester C. Thurow's extrasystemic hypothesis. See "Measuring the Economic Benefits of Education," in Margaret S. Gordon, ed., *Higher Education and the Labor Market,* McGraw-Hill Book Co., New York, 1974. Also see "Education and Economic Equality," *The Public Interest,* no. 43, Spring 1976, pp. 66-81.

The model and systemic principles also offer a complementary explanation to Raymond Boudon's partly systemic, but also logico-mathematical, model. See *Education, Opportunity, and Social Inequality*, John Wiley & Sons, New York, 1974. Also see "Educational Growth and Economic Equality," *Quality and Quantity*, 8, 1974, pp. 1-10.

7. National Center for Educational Statistics: *Digest of Educational Statistics 1979*, U.S. Department of Health, Education and Welfare, U.S. Government Printing Office, Washington, D. C., 1979, Table 60, p. 63.

8. M. R. Spiegal: "Areas Under the Standard Normal Curve from 0 to Z," *Theory and Problems of Statistics*, McGraw-Hill Book Co., New York, 1961, p. 343.

My thanks to Daniel R. Tobin for his suggestions concerning the standardized normal curve.